

AMENDMENTS TO THE DRAWINGS

The attached sheets of drawings include changes to Figs. 1-3. The replacement sheets containing Figs. 1-3 replace the previously amended sheets containing Figs. 1-3. Figs. 1-3 are amended to inset the legend --Prior Art--.

Attachment: Replacement Sheets

Annotated Sheets Showing Changes

REMARKS/ARGUMENTS

Claims 1-20 are currently pending in the present application. Claims 1-20 were rejected. By this amendment, corrected figures are submitted, claims 4 and 8 are cancelled without prejudice to filing a continuing application and claims 1-3, 5, 9, 14, 15 and 20 are amended. Applicants submit that such amendments place the claims in condition for allowance.

Applicants' Invention

Applicants' invention is related to a method for improving throughput in continuous electrodialysis processes in an electrodialysis stack. In at least one embodiment, the method comprises automatically controlling the pH of acid loop solutions in strong acid/weak base configurations and of base-loop solutions in weak acid/strong base configurations. The method includes adding a buffer to the solutions, where the buffer is regenerated continuously and external to the electrodialysis stack. The concentrations of the anionic and cationic moieties of the buffer are dependent upon a desired pH. Support for these features may be found at page 6, lines 13-19; page 10 lines 12-20; page 11 lines 22-23 and page 12 lines 1-9.

Drawing Corrections

The attached sheets of drawings include changes to Figs. 1-3. Figs. 1-3 are amended to inset the legend --Prior Art--. No new matter is added.

Non-Narrowing Amendments

Claims 2-3, 5, 9, 15 and 20 have been amended to correct minor typographical errors and/or correct dependency and do not otherwise affect or narrow the claim elements with respect to patentability. Therefore, Applicants believe that these amendments do not create prosecution history estoppel with respect to these claims and further does not affect the range of equivalents with respect thereto.

Butterworth does not disclose continuous regeneration or pH dependent moieties

Claims 14-20 stand rejected under 35 U.S.C. §102(b) as being anticipated by Butterworth, U.S. Patent No. 5,207,879 (hereinafter "*Butterworth*"). Claim 14 has been amended to more clearly define Applicants' invention. Support for these features may be found at page 6, lines 13-19; page 10 lines 12-20; page 11 lines 22-23 and page 12 lines 1-9. Applicants respectfully submit that the §102(b) rejection of claims 14-20 has been overcome and the pending claims are allowable.

Anticipation under 35 U.S.C. §102(b) requires "the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim."¹ Applicants submit that *Butterworth* does not disclose each and every element of claim 14 as now more clearly defined.

The Office Action provides that *Butterworth* discloses:

controlling the pH in an acid loop by the electro dialysis cell in operation within two pH units (see col. 2, lines 30-50 and claims 1-11). The pH would be maintained within two units, since the quantity of the acid is said to remain substantially constant. The fact that the pH in the acid loop would protect the bipolar membrane would be inherent to the process disclosed in *Butterworth*.²

Applicants respectfully disagree.

Applicants do not agree that *Butterworth* discloses "controlling the pH in an acid loop by the electro dialysis cell in operation within two pH units" as provided previously. Rather, Applicants submit that *Butterworth* discloses a "fourth channel, that formed by the bipolar membrane and the second cation-selective membrane, has flowing through it an acid with a multivalent anion ... the presence of the multivalent acid in the fourth channel serves as a buffer..."³. *Butterworth* further discloses that sulfuric acid is the preferred buffer.⁴ Thus it appears that *Butterworth* discloses a channel having a

¹ *Lindermann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 221 USPQ 481, 485 (Fed. Cir. 1984) (citing *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 220 USPQ 193 (Fed. Cir. 1983)).

² Office Action, page 3, lines 3-8.

³ *Butterworth* col. 2, lines 39-44.

⁴ See for example *Butterworth* col. 5, lines 8-9.

multivalent acid (i.e., sulfuric acid) that serves as a barrier between the two channels containing the solution chemistry of interest. *Butterworth* does not disclose, or otherwise suggest, a buffer solution as provided in the Office Action or as claimed.

Assuming, *arguendo*, that *Butterworth* discloses “controlling the pH in an acid loop by the electrodialysis cell in operation within two pH units” as provided previously, *Butterworth* does not teach, or even suggest, “the buffer is regenerated continuously and external to the electrodialysis cell components” alone or in combination with the “concentrations of the anionic and cationic moieties of the buffer are dependent upon a desired pH” as recited by amended claim 14 among other features.

As *Butterworth* does not teach, or otherwise suggest, each and every element of the claimed invention, the §102(b) rejection of claim 14 is overcome.

Claims 15-20 depend, directly or indirectly, from claim 14 and include all of the limitations thereof. The rejection of claims 15-20 based on *Butterworth* is overcome for all the reasons provided above with respect to claim 14.

Separately, to constitute a proper anticipatory reference under §102(b), the reference must generally place the subject matter supporting the anticipatory rejection in the public domain before the date of the invention. For example, the CCPA has stated:

[f]or a publication to constitute an anticipation of an invention and, thus, to bar the grant of a patent under 35 USC 102, it must be capable, when taken in conjunction with the knowledge of those skilled in the art to which it pertains, of placing the invention in the possession of the public.⁵

Applicants respectfully submit that the claimed “buffer, wherein the buffer is regenerated continuously” alone or in combination with “concentrations of the anionic and cationic moieties of the buffer dependent upon the desired pH” is not placed in the public domain by *Butterworth*.

The Office Action suggests that *Butterworth* discloses “controlling the pH in an acid loop by the electrodialysis cell in operation within two pH units” as provided

⁵ *In re Donohue*, 632 F.2d 123, 207 USPQ 196, 199 (CCPA 1980) (citing *In re LeGrice*, 301 F.2d 929, 944, 133 USPQ 365, 378 (CCPA 1962) and *In re Brown*, 329 F.2d 1006, 1011, 141 USPQ 245, 249 (CCPA 1964).

previously. However, Applicants believe that *Butterworth* discloses “a channel having a multivalent acid (i.e., sulfuric acid) that serves as a barrier between the two channels containing the solution chemistry of interest”. No matter which interpretation of *Butterworth* is correct, neither interpretation discloses the claimed invention. As *Butterworth* does not disclose the claimed invention; it therefore does not place it in the public domain. As *Butterworth* does not place the claimed invention in the public domain, the §102(b) anticipatory rejection is not supported.

Mani does not disclose continuous regeneration or pH dependent moieties

Claims 1-20 stand rejected under 35 U.S.C. §102(b) as being anticipated by Mani, U.S. Patent No. 6,627,016 (hereinafter “*Mani*”). Claims 4 and 8 are cancelled without prejudice, and claims 1 and 14 have been amended to more clearly define Applicants’ invention. Support for these features may be found at page 6, lines 13-19; page 10 lines 12-20; page 11 lines 22-23 and page 12 lines 1-9. Applicants respectfully submit that the §102(b) rejection of claims 1-20 has been overcome and the pending claims are allowable.

Again, §102(b) anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention as provided previously. Applicants submit that *Mani* does not disclose each and every element of claims 1 and 14 as now more clearly defined.

The Office Action provides that *Mani* discloses:

the treatment of base of acid loops to maintain the pH within claimed ranges by the use of combinations of salt or acid/base to form the buffer as claimed (see col. 12, lines 7-13 and col. 13, lines 8-57). The addition of the base and/or the acid or salt would form the buffer and maintain the pH within the desired range within the acid or base loop as claimed. The base and acid are controlled externally to the stack- (see Figure 7 for example) which shows the use of base and acid tank external to the electrodialysis stack) The temperature would be ambient and would range within the claimed range.⁶

⁶ Office Action, page 3, lines 13-18 and p. 4, lines 1-2.

Applicants respectfully disagree.

Applicants respectfully submit that *Mani* does not disclose the addition of the base and/or the acid or salt that would form the buffer and maintain the pH within the desired range within the acid or base loop as provided in the Office Action. Rather, Applicants respectfully submit that *Mani* discloses a method by which the pH of a process stream is controlled by adding a neutralizing agent (e.g., CO₂, sodium bicarbonate, sodium bisulfate, or SO₂)⁷ and controlling pH using ion exchange columns in a feed-and-bleed mode.⁸ In effect, *Mani* discloses a neutralizing agent and a feed-and-bleed ion exchange stack to control the process stream pH. *Mani* does not disclose, or otherwise suggest, the claimed buffer.

Assuming, *arguendo*, that *Mani* discloses “the addition of the base and/or the acid or salt would form the buffer and maintain the pH within the desired range within the acid or base loop” as provided previously, *Mani* does not teach, or even suggest, “the buffer is regenerated continuously and external to the electrodialysis stack” in combination with “concentrations of the anionic and cationic moieties of the buffer are dependent upon a desired pH” as recited by amended claim 1 among other features or “the buffer is regenerated continuously and external to the electrodialysis cell components” in combination with “concentrations of the anionic and cationic moieties of the buffer are dependent upon a desired pH” as recited by amended claim 14, among other features.

Claims 2-3, 5-7, 9-13 and 15-20 depend, directly or indirectly, from claims 1 and 14 respectively, and include all of the limitations thereof. The rejection of claims 2-3, 5-7, 9-13 and 15-20 based on *Mani* is overcome for all the reasons provided above with respect to claims 1 and 14.

Again, to constitute a proper anticipatory reference under §102(b), the reference must generally place the subject matter supporting the anticipatory rejection in the public domain before the date of the invention.

⁷ See for example *Mani*, col. 12, lines 14-15.

⁸ See for example *Mani*, col. 13, lines 7-10.

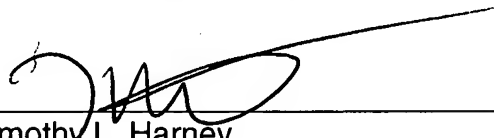
Applicants respectfully submit that *Mani* does not place the claimed invention in the public domain. The Office Action suggests that *Mani* discloses "the addition of the base and/or the acid or salt would form the buffer and maintain the pH within the desired range within the acid or base loop." However, Applicants believe that *Mani* only discloses a neutralizing agent and a feed-and-bleed ion exchange stack to control the process stream pH as provided previously. Again, no matter which interpretation of *Mani* is correct, neither interpretation discloses the claimed invention. As *Mani* does not disclose the claimed invention; it therefore does not place it in the public domain. As *Mani* does not place the claimed invention in the public domain, the §102(b) anticipatory rejection is not supported.

In view of the foregoing, it is respectfully submitted that the pending claims define allowable subject matter. Should anything remain in order to place the present application in condition for allowance, the Examiner is kindly invited to contact the undersigned at the telephone number listed below.

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Respectfully submitted,

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1/3

-- Prior Art --

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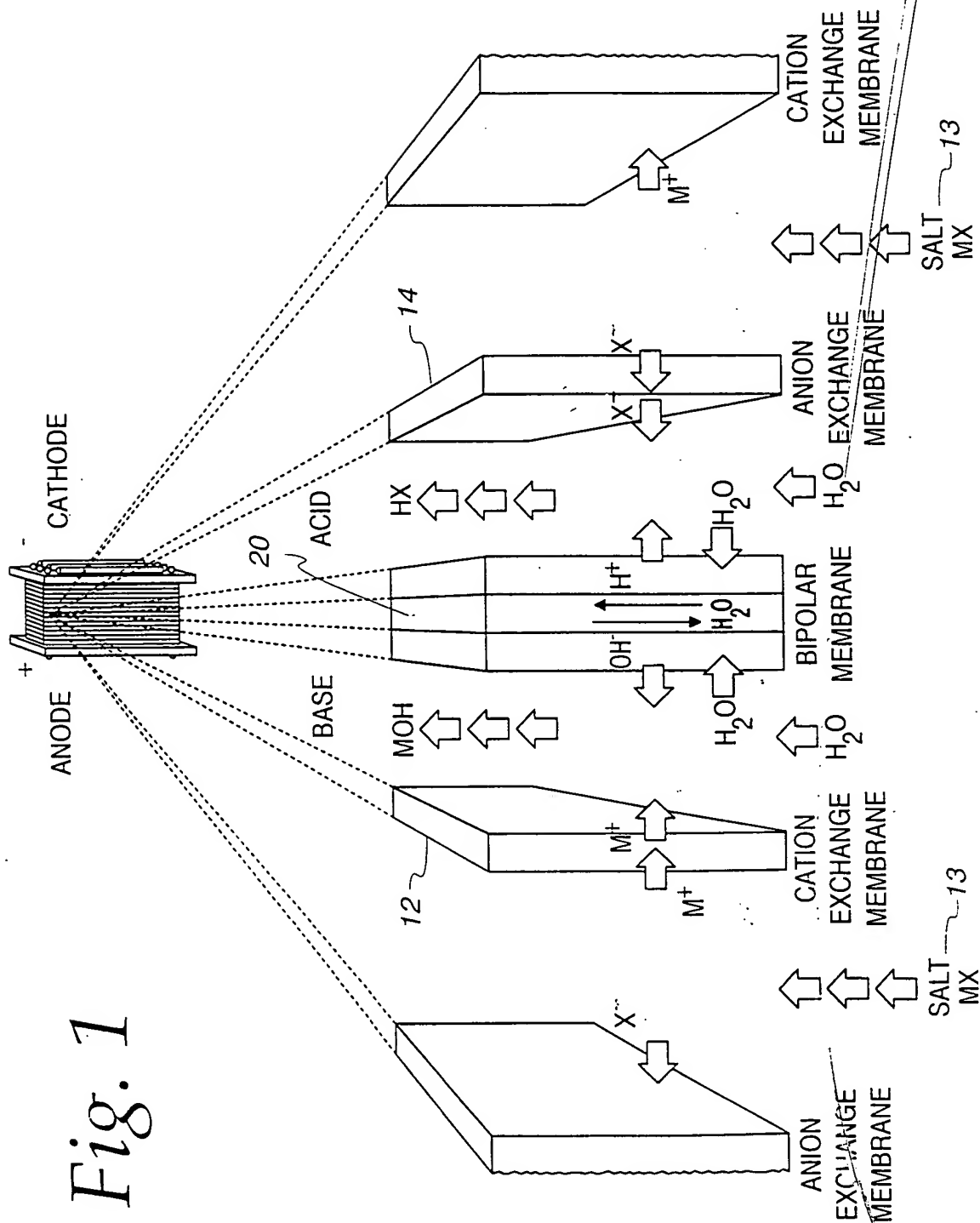


Fig. 1

2/3
--Prior Art--

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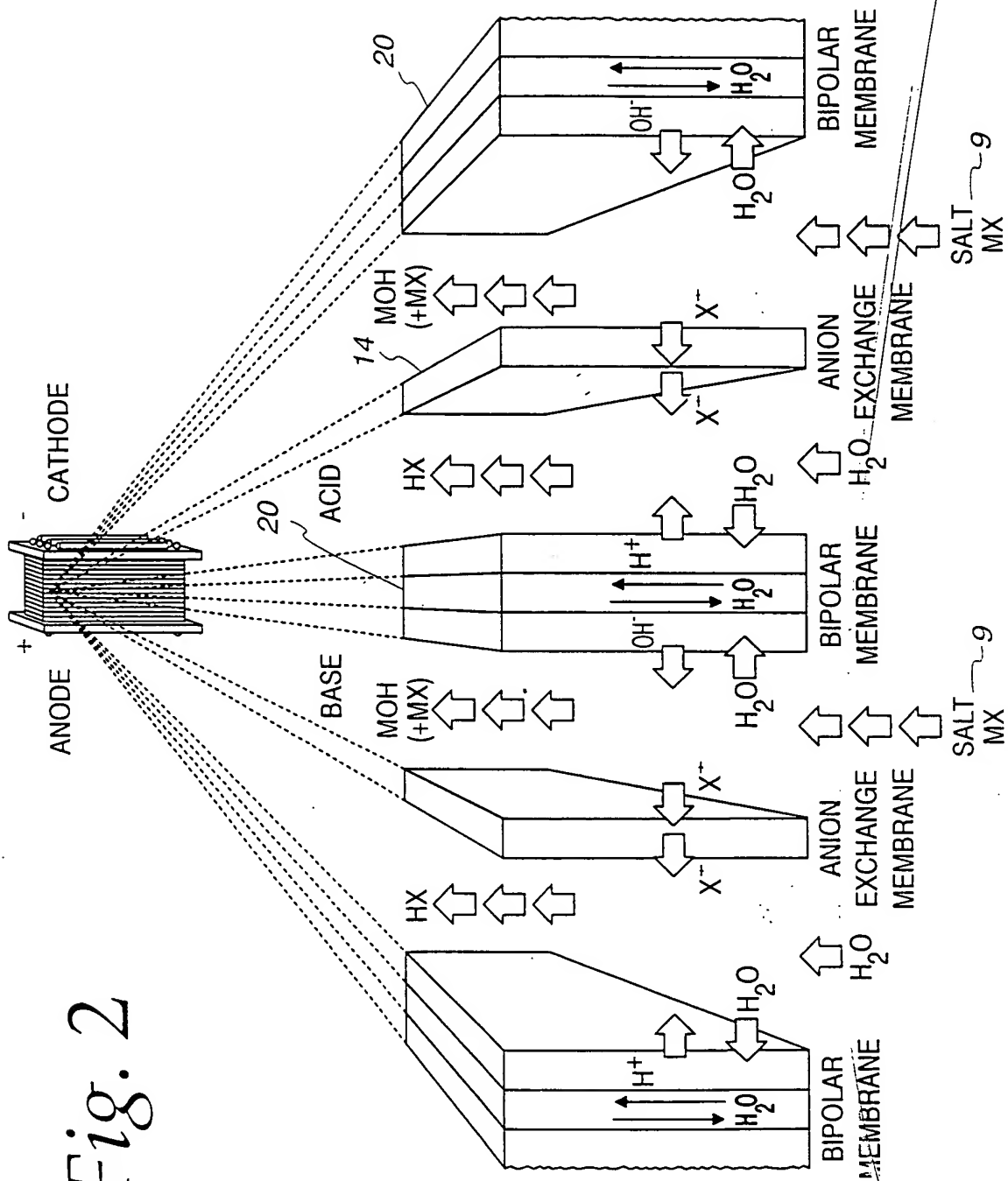
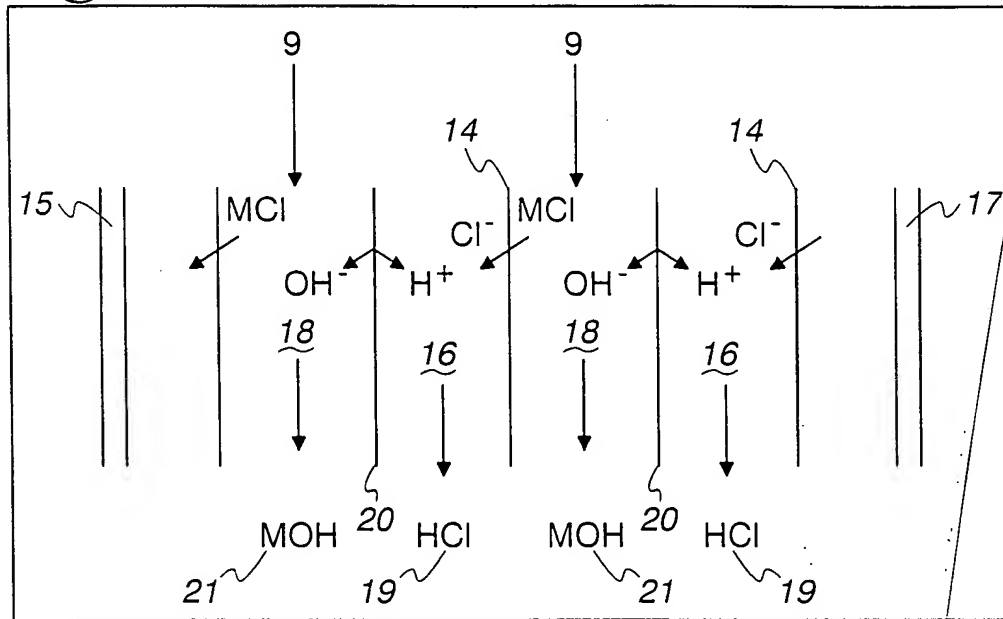


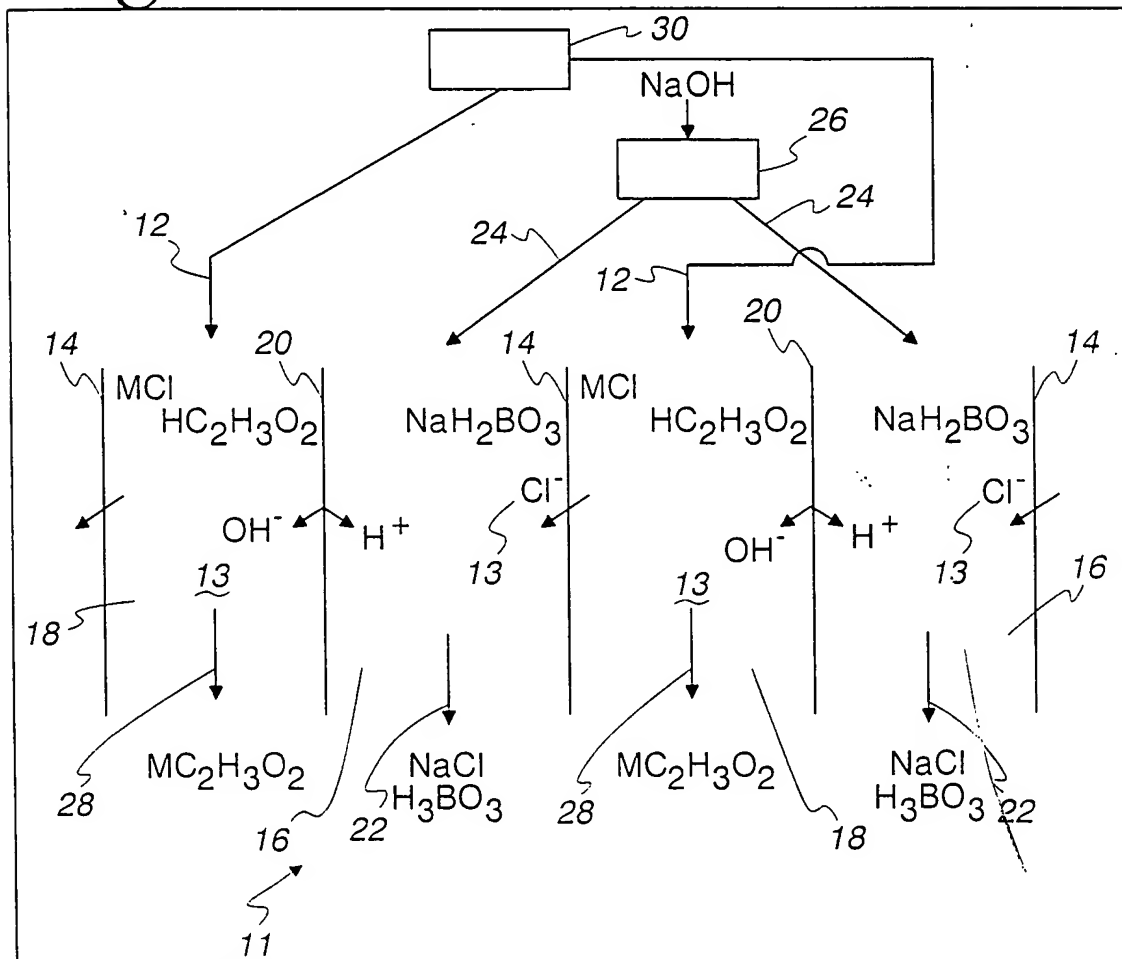
Fig. 2

Fig. 3 -- Prior Art -- 3/3



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Fig. 4



APPENDIX